UPPER COLORADO
2003 WATER YEAR IN REVIEW

A LOOK BACK AT LAST YEAR....

This is a summary of the 2003 Upper Colorado River Basin water supply forecasts and subsequent observed runoff volumes where available. Volume forecasts and observations are for the April-July period (except where indicated) and are expressed in 1000's of acre-feet. Averages used are for the 1971-2000 period.

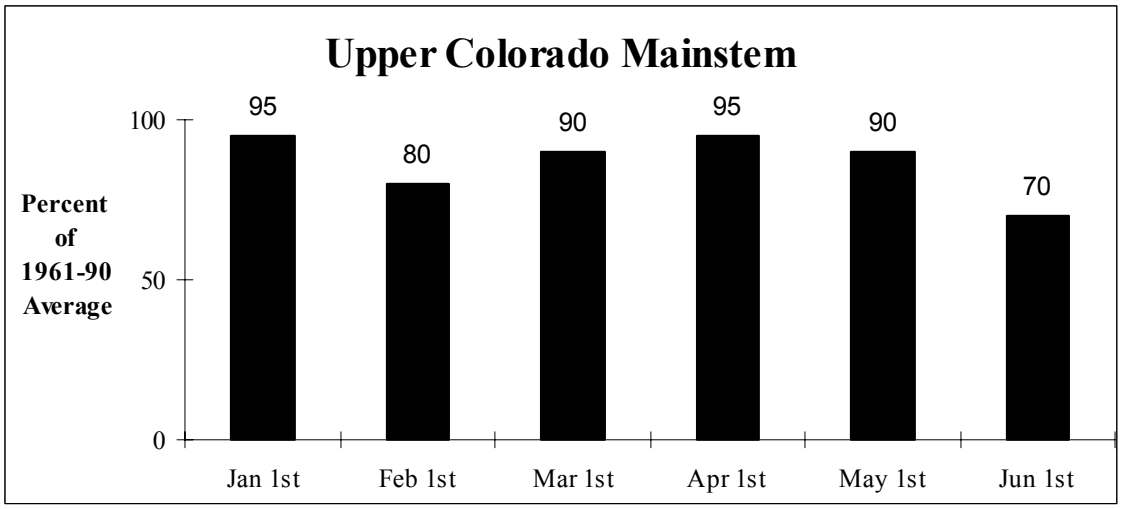
This product is designed to assist individuals and agencies with water supply concerns in summarizing last year's (2003) spring runoff and in planning for the coming year.

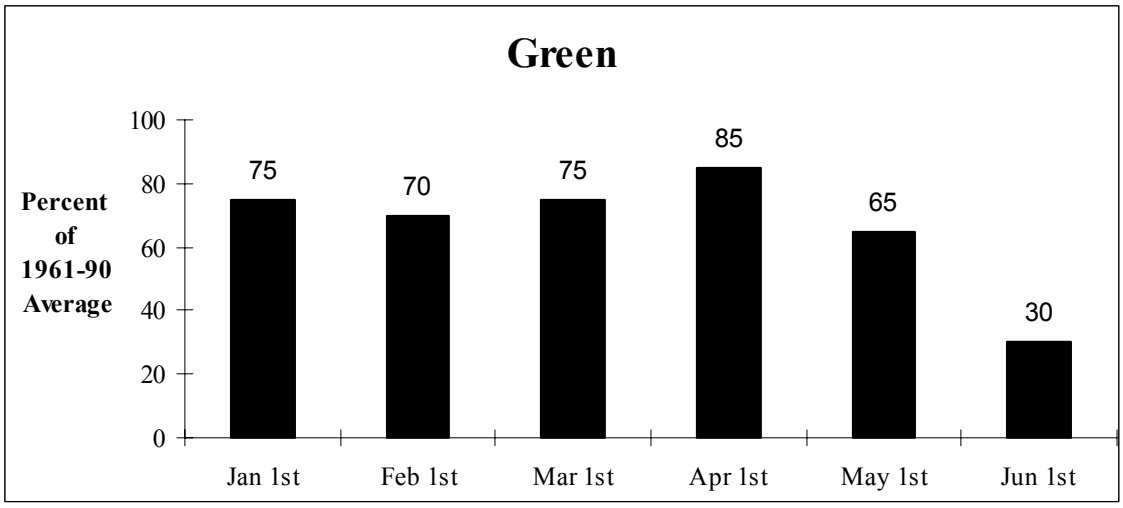
Please note that all observed values are provisional. Final values may differ from those listed herein. Many adjustments for diversions have been estimated from historical averages. In extreme years these *average* estimates may result in large discrepancies between provisional and final values. In addition, during hot, dry summers both unknown/unmeasured diversions and environmental losses due to evaporation and channel transmission tend to increase. Total abstractions, engineered and environmentally induced, may cause natural flow calculations to yield a number less than zero, particularly at locations well downstream. At such locations, comparisons between forecast and observed flows become more difficult and less meaningful.

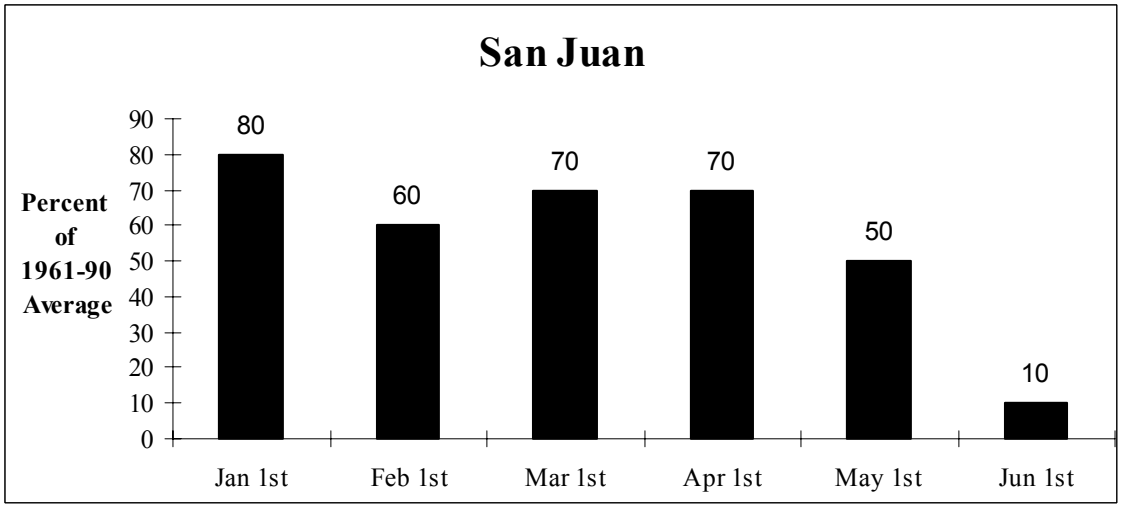
Included in this review is expanded treatment of the confidence intervals associated with forecasts. The reasonable maximum and minimum values, which form the boundaries of the confidence interval, are statistical measures reflecting both the accuracy of the regressions equation used to produce the forecast and the natural variability of streamflow volume. As the forecast season progresses, confidence intervals should narrow as meteorological conditions become known. The most probable forecast, a 50% exceedance probability, is most often cited. However, the reasonable minimum, a 90% exceedance probability, and maximum, a 10% exceedance probability, are important indicators of the "confidence" of the most probable forecast. Under normal meteorological circumstances, observed flows will fall within the confidence interval 80% of the time; flows may occur outside interval boundaries in years exhibiting uncharacteristic conditions.

SPRING 2003 SNOWPACK REVIEW

Snow Water Equivalent







2003 Forecast Summary for: UPPER COLORADO MAINSTEM

April-July volumes unless otherwise noted

STREAM	STATION	JAN	FEB	MAR	APR	MAY	JUN	OBS	%AVG
COLORADO	LAKE GRANBY, GRANBY, NR	185	170	180	225	250	250	264	117
	HOT SULPHUR SPRINGS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	DOTSERO, NR	1150	1080	1200	1400	1550	1400	1410	98
	GLENWOOD SPRINGS, BLO	1800	1650	1770	1950	2100	1950	1990	92
	CAMEO, NR	2000	1800	1930	2150	2350	2150	2160	89
	CISCO, NR	3700	3100	3350	3600	3600	3300	3240	70
WILLOW CK	WILLOW CK RES, GRANBY, NR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FRASER	WINTER PARK, NR, UPR, STATION	16.5	15	16	19	21	21	21	105
WILLIAMS FORK	WILLIAMS FORK RES, PARSHALL, NR	80	75	80	100	100	100	114	120
EF TROUBLESOME CK	TROUBLESOME, NR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BLUE	DILLON RES	140	130	140	170	185	165	169	101
	GREEN MTN RES	240	225	240	300	315	285	290	104
EAGLE	GYPSUM, BLO	290	265	275	285	325	325	324	97
FRYING PAN	RUEDI RES, BASALT, NR	125	110	115	115	115	115	126	89
ROARING FORK	GLENWOOD SPRINGS	625	550	550	550	550	550	560	79
PLATEAU CK	CAMEO, NR	70	65	80	75	65	70	56	49
TAYLOR	TAYLOR PARK RES	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	ALMONT	130	110	119	119	112	103	114	69
EAST	ALMONT	165	140	145	145	135	140	142	74
GUNNISON	GUNNISON, NR	315	265	270	270	260	250	259	66
	GRAND JUNCTION, NR	1200	950	1050	1050	920	900	845	54
MUDDY CK	PAONIA RES, BARDINE, NR	81	66	76	70	61	59	55	54
NF GUNNISON	SOMERSET NE	245	210	235	220	200	210	216	71
SURFACE CK	CEDAREDGE	12.7	10	12	12	10.6	12	11	64
UNCOMPAHGRE	RIDGWAY RES	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	COLONA	108	85	87	78	75	83	87	63
	DELTA	87	65	68	60	55	63	45	38
DOLORES	DOLORES	210	175	190	180	160	140	139	52
	MCPHEE RES	250	205	225	210	180	155	146	46
	CISCO, NR	360	250	285	270	190	190	167	30
SAN MIGUEL	PLACERVILLE,NR	107	90	95	95	77	88	88	67
	NATURITA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MILL CK	MOAB, NR, SHELEY TUN, AT	4	3	3.3	4	2	2.8	2.8	56
INDIAN CK	MONTICELLO, NR, BOGUS POCKET ◆	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

◆ March-July Forecast Period

Provisional Flows in 1000 Acre - Feet

2003 Forecast Summary for: GREEN RIVER BASIN

April-July volumes unless otherwise noted

STREAM	STATION	JAN	FEB	MAR	APR	MAY	JUN	OBS	%AVG
GREEN	DANIEL, NR, WARREN BRIDGE, AT	185	200	205	235	200	190	N/A	N/A
	GREEN RIVER, WY, NR	515	515	520	650	515	460	706	81
	GREEN RIVER, UT	2130	1800	1910	2150	1950	1950	1900	60
PINE CK	FREMONT LK, ABV	78	80	83	93	83	89	N/A	N/A
NEW FORK	BIG PINEY, NR	265	255	260	300	260	240	N/A	N/A
BIG SANDY	FARSON, NR	38	37	38	41	38	38	N/A	N/A
BLACKS FK	MILLBURNE, NR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
EF SMITHS FORK	ROBERTSON, NR	18.8	17	17.5	18.8	17.2	17.2	26	84
HAMS FORK	FRONTIER, NR, POLE CK, BLO	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	VIVA NAUGHTON RES	60	47	52	58	46	39	N/A	N/A
YAMPA	STAGECOACH RES, BLO	N/A	N/A	N/A	N/A	26	N/A	N/A	N/A
	STEAMBOAT SPRINGS	230	200	245	245	255	260	268	96
	MAYBELL, NR	790	650	790	820	820	880	990	100
ELKHEAD CK	ELKHEAD, NR	28	24	25	30	30	35	N/A	N/A
FORTIFICATION CK	FORTIFICATION, NR	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
LITTLE SNAKE	SLATER, NR	120	100	118	126	126	126	N/A	N/A
	DIXON, NR	250	210	245	260	260	260	N/A	N/A
	LILY, NR	275	235	265	285	285	285	N/A	N/A
BIG BRUSH CK	VERNAL, NR RED FLEET RES, ABV	14.7	13	15	16.5	12	14.3	N/A	N/A
ASHLEY CK	VERNAL, NR	40	33	36	36	29	32	N/A	N/A
WF DUCHESNE	HANNA, NR	16.5	13	13	11	9	9	N/A	N/A
ROCK CK	UPPER STILL WATER RES	57	45	45	49	45	45	N/A	N/A
	MTN HOME, NR	62	49	49	51	49	49	94	106
DUCHESNE	TABIONA, NR	74	57	57	54	50	50	99	94
	DUCHESNE, NR, KNIGHT DIV, ABV	125	98	98	98	92	92	N/A	N/A
	MYTON	140	90	90	78	60	67	246	95
	RANDLETT, NR	170	114	114	100	75	75	252	78

Provisional Flows in 1000 Acre-Feet

2003 Forecast Summary for: GREEN RIVER BASIN

April-July volumes unless otherwise noted

STREAM	STATION	JAN	FEB	MAR	APR	MAY	JUN	OBS	%AVG
STRAWBERRY	SOLDIER SPRINGS, NR	40	24	24	24	17.5	17.5	27	46
	DUCHESNE, NR	79	49	49	49	40	40	71	59
CURRANT CK	CURRANT CK RES	15.3	10.2	10.2	8.5	6.8	6.8	5.5	22
LAKE FORK	MOON LK RES, MTN HOME, NR	49	38	38	40	36	44	65	96
YELLOWSTONE	ALTONAH, NR	45	36	36	36	32	43	N/A	N/A
WHITEROCKS	WHITEROCK, NR	43	35	35	35	26	36	N/A	N/A
WHITE	MEEKER, NR	235	190	190	180	175	245	N/A	N/A
	WATSON, NR	245	198	200	190	210	250	N/A	N/A
GOOSEBERRY CK	SCOFIELD, NR	9.2	7.3	7.3	7.8	7	8.5	N/A	N/A
PRICE	SCOFIELD RES, SCOFIELD, NR	38	30	28	32	30	32	32	70
WHITE	BLO TABBYUNE CK, SOLDIER SUMMIT	12.5	9.6	9.6	9.6	8.4	8.4	N/A	N/A
HUNTINGTON CK	ELECTRIC LAKE	12.5	9.5	10	10.6	8.5	9	N/A	N/A
	HUNTINGTON, NR	40	30	30	32	32	32	42	84
SEELEY CK	JOES VALLEY RES, ORANGEVILLE, NR	43	34	34	34	29	29	43	74
FERRON CK	FERRON, NR	33	25	26	26	22	22	N/A	N/A
SEVEN MILE CK	FISH LAKE, NR	5.1	4	5.1	6.8	6	5.7	N/A	N/A
MUDDY CK	EMERY, NR	16.3	13	14	14	13	13	N/A	N/A

Provisional Flows in 1000 Acre-Feet

2003 Forecast Summary for: SAN JUAN BASIN

April-July volumes unless otherwise noted

STREAM	STATION	JAN	FEB	MAR	APR	MAY	JUN	OBS	%AVG
SAN JUAN	PAGOSA SPRINGS	145	115	135	135	125	110	115	51
	CARRACAS, NR	280	230	240	240	200	200	190	47
	FARMINGTON	850	620	705	585	510	470	478	40
	BLUFF, NR	800	600	675	580	475	460	448	36
RIO BLANCO	PAGOSA SPRINGS, NR, BLANCO DAM	35	30	35	34	30	29	33	62
NAVAJO	CHROMO, NR, OSO DIV DAM, BLO	N/A	45	N/A	0	0	0	13.9	53
PIEDRA	ARBOLES, NR	150	135	140	110	100	105	91	40
LOS PINOS	VALLECITO RES, BAYFIELD, NR	136	118	125	115	105	110	106	52
ANIMAS	DURANGO	330	255	285	265	240	230	242	55
FLORIDA	LEMON RES, DURANGO, NR	42	32	37	31	28	30	28	48
LA PLATA	HESPERUS	18.6	15	18	16.5	11.3	14	13.9	56
MONTEZUMA CK	MONTICELLO, GOLF COURSE, AT ◆	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RECAPTURE CK	BLANDING, NR, JOHNSON CK, BLO ◆	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

◆ March-July Forecast Period

Provisional Flows in 1000 Acre - Feet

What makes a **GOOD** water supply forecast?... a **BAD** forecast?

Is it as simple as which forecast comes closest to the actual observation? Probably not, as a number of factors necessitate a more sophisticated evaluation of forecast quality be undertaken. Such an evaluation would not be trivial and is beyond the time and space constraints of this note. Nonetheless, with apologies for simplification and omission, some of the factors include:

subsequent meteorologic conditions - the implicit assumption behind any forecast is that the meteorologic conditions during the remainder of the snow accumulation and melt season will be "normal." While it may be difficult to adequately define what "normal" is, it is easier to discern conditions that are extreme or "not normal." As such, a given forecast at a given time may have been the best forecast possible in light of known conditions, although ultimately turning out to be 20% too low; it just so happened that the ensuing meteorologic conditions were unusually wet. Just as a good forecast may be made to look bad by abnormal conditions in the future, the reverse situation is also possible.

natural variability of site's streamflow - simply put, some rivers are much more difficult to forecast then others. Historically, such river flows may vary over a wide range and be quite sensitive to changing conditions, particularly in environs where the number of precipitation events are few. On the other hand, some river flows may be relatively constant with the effects of diverse conditions dampened. Oftentimes scale is a good indicator of the variability of flow at a given site. A 20% error on a small stream in Arizona may be more laudable than a 10% error on Lake Powell inflow.

character of the year - by definition, extreme events are rare and forecasting such events become more difficult. Because the number of past extreme events is small, less is known about the distribution and variability than in situations with "near-normal" populations. Even if it was possible to remove uncertainty about future meteorological conditions, there would still be more error associated with forecasting extreme events.

During the extreme conditions there is a demand that the forecaster make a more powerful (and potentially more valuable) statement: in effect, that "even normal conditions from here on out will not be enough to compensate for current abnormal snowpack and soil states." It is during such events that consideration of information other than just the most probable forecast become especially important. Probability statements that convey the likelihood of exceeding a certain level (such as the reasonable maximum and minimum forecasts) help to underscore the uncertainty associated with the forecast.

So why do it? although it may not be a simple matter to grade a forecast, it is still useful for users and forecasters alike to review the previous year's forecasts and adjusted observations (provisional as they may be with estimated diversions) so as to act on obvious problems and to gain perspective for the coming forecast season.

Additional Information

Water supply forecasts take into consideration present hydrometeorological conditions and use average basin temperatures and precipitation for the forecast period. As the forecast season progresses, a greater portion of the future hydrologic and meteorological uncertainty becomes known and monthly forecasts become more accurate. Volume forecasts represent adjusted flows; that is, observed flows with upstream water use taken into account. At best, adjusted flows will closely approximate natural or unimpaired flows.
However, not all upstream diversions or impoundments are measured, quantifiable or predictable.

The Water Supply Outlook is issued monthly January through May by the Colorado Basin River Forecast Center, National Weather Service. It represents a coordinated effort between the National Weather Service, soil Conservation Service, Bureau of Reclamation, U.S. Geological Survey and local water district managers.

DEFINITIONS:
Acre-Foot:
The volume equal to one acre covered one foot deep (43,560 cubic feet).

Average:
The arithmetic mean. The sum of the values divided by the number of values.

Categories:

Much above Average	Above Average	Near Average	Below Average	Much below Average
Greater than 30%	111 - 130%	90 - 100%	70 - 89%	Less than 70%F

Forecast Period: The period from April 1 to July 31.

Most Probable Forecast:
Given the current hydrometeorological conditions to date, this is the best estimate of what the runoff volume will be this season.

Reasonable Maximum Forecast:
Given the current hydrometeorological conditions, the seasonal runoff that has a ten percent (10%) chance of being exceeded.

Reasonable Minimum Forecast:
Given the current hydrometeorological conditions, the seasonal runoff that has a ninety percent (90%) chance of being exceeded.

Water Year: The period from October 1 through September 30.
NOTE: Data used in this report are provisional and are subject to revision.
For more information, or to be included on the mailing list, please contact:
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